NOTICE OF CHANGE

NOT MEASUREMENT SENSITIVE

MIL-STD-810E
NOTICE 1
9 February 1990

MILITARY STANDARD

ENVIRONMENTAL TEST METHODS
AND
ENGINEERING GUIDELINES

TO ALL HOLDERS OF MIL-STD-810E:

1. THE FOLLOWING PAGES OF MIL-STD-810E HAVE BEEN REVISED AND SUPERSEDE THE PAGES LISTED:

NEW PAGE	DATE	SUPERSEDED PAGE	DATE
520.1-21	14 JULY 1989	520.1-21	REPRINTED WITHOUT CHANGE
520.1-22	14 JULY 1989	520.1-22	9 FEBRUARY 1990
523.1-5	14 JULY 1989	523.1-5	REPRINTED WITHOUT CHANGE
523.1-6	14 JULY 1989	521.1-6	14 JULY 1989

2. RETAIN THIS NOTICE AND INSERT BEFORE TABLE OF CONTENTS.

3. Holders of MIL-STD-810E will verify that page changes and additions indicated above have been entered. This notice page will be retained as a check sheet. This issuance, together with appended pages, is a separate publication. Each notice is to be retained by stocking points until the military standard is completely revised or cancelled.

Custodians:
Army - TE
Navy - AS
Air Force - 11

Preparing activity:
Air Force - 11

(Project No. ENVR-0023)

Review activities:
Army - MI, ME, AV, GL, MT, AT, CE, AR, SM
Navy - SH, OS, YD, EC
Air Force, 10, 18, 19, 69

International interest:
See 6.3

AMSC F4766

AREA ENVR

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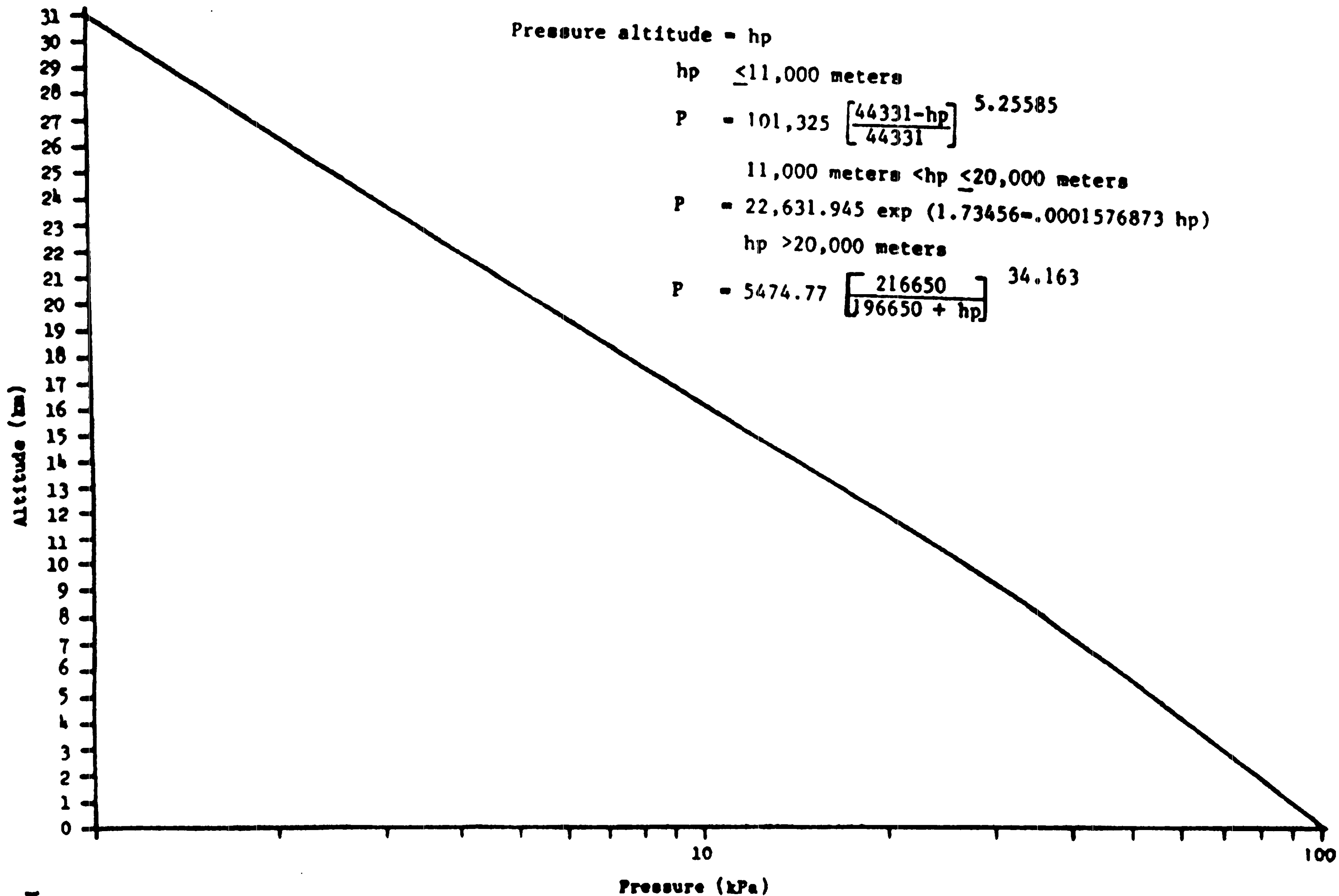

Pressure altitude = hp

hp $\leq$11,000 meters

$$P = 101{,}325 \left[\frac{44331-hp}{44331}\right]^{5.25585}$$

11,000 meters <hp $\leq$20,000 meters

$$P = 22{,}631.945 \exp\left(1.73456-.0001576873\ hp\right)$$

hp >20,000 meters

$$P = 5474.77 \left[\frac{216650}{196650 + hp}\right]^{34.163}$$

FIGURE 520.1-4. Altitude vs pressure.

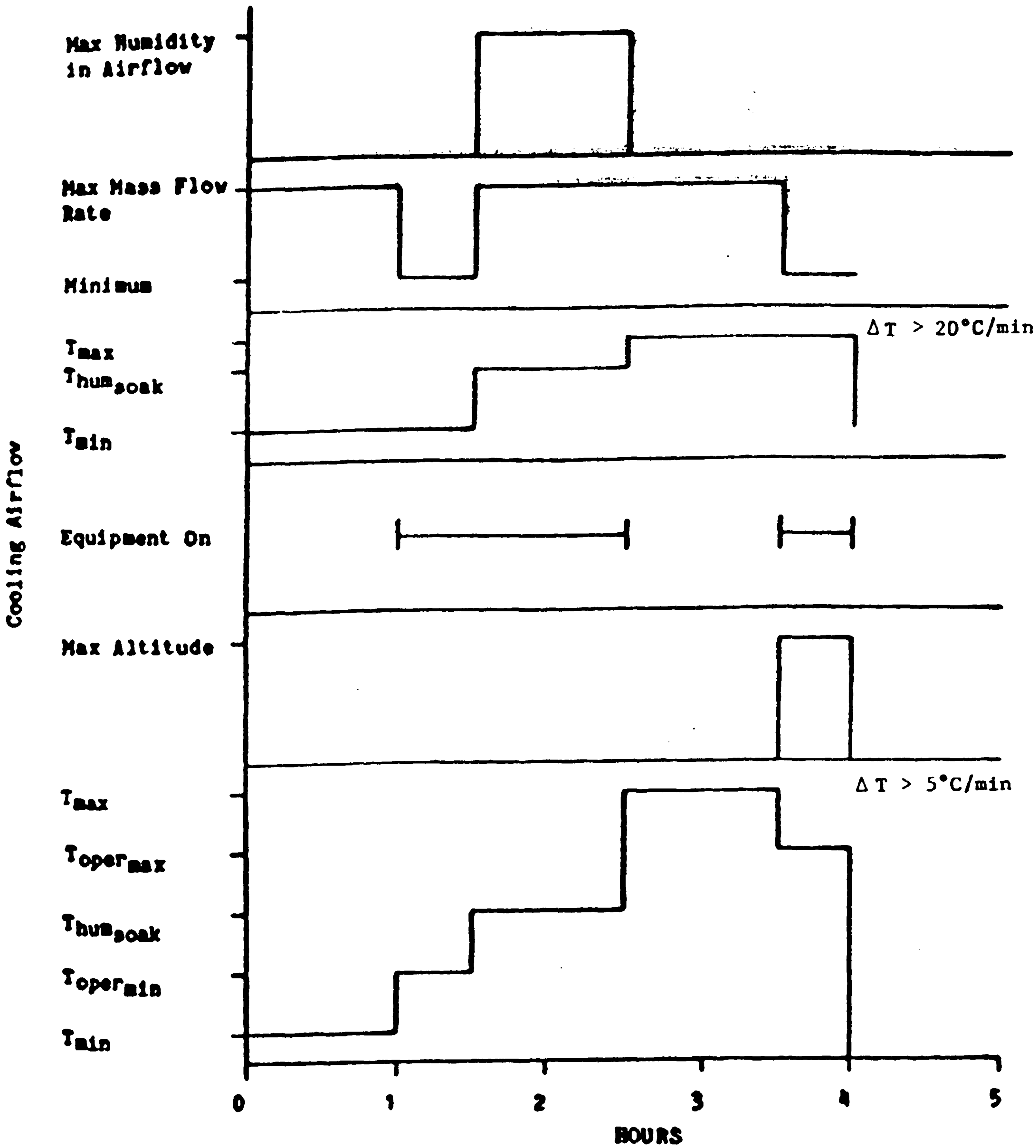

FIGURE 520.1-5. Qualification test cycle example.

b. Restrictions. This method is intended primarily for the electronics and electro-mechanical assemblies within the store.

c. Sequence. This method applies to the environmental stresses occurring in the final phases of the store's logistic cycle, and when used in combination with other test methods, should follow these methods.

d. Test variations. Unlike the other methods in this standard, this method contains no step-by-step procedure for generating valid test data. The vibro/acoustic/temperature environment is too complex, and the variety of equipment applications too great, for such detailed instructions to be given here. Instead, this method provides guidance for writing a test procedure which will be more or less unique for the item under consideration.

I-3.1 Background. Experiments have shown (ref a) that the only way to reproduce the service failure distribution is to reproduce the service stress distribution. Stress distribution is a range of stresses, in proper proportion, of level and durations determined by mission profiles. The proportioning is applied to vibration, temperature, thermal shock and electrical stress. Procedure I uses combinations of temperature, acoustic vibration, mechanical vibration, and store operating patterns to simulate in-service missions.

I-3.2 General. Military aircraft service use may be characterized by a set of specialized missions, with a duration and relative frequency assigned to each mission type. Each mission type is described by its "mission profile" and idealized mission history which specifies altitude, velocity and operating state as a function of time; and which locates the occurrence of stressful events such as special maneuvers, gunfire and landings. From such mission profiles, corresponding mission environment histories (e.g., vibration levels, skin temperatures) can be constructed. Data from instrumented flights may be used in this construction. By treating the mission environment profiles probabilistically, summing the durations of each stress level in each mission, and weighting by the relative frequency of each mission, a service distribution function for each stress may be obtained. A composite environment profile may then be constructed for each stress of interest. This composite environmental profile is a sequence of stress levels constructed to simulate the service environment profiles for the different missions taken together. Its total duration should be no longer than a few missions, it must represent realistic flight conditions, and it must reflect the calculated combined service distribution function for the stress. A composite mission profile consists of the combination of composite environmental profiles for each environment, so coordinated that the mixture of stress levels at any point in time represents the typical service condition being simulated. Simulation of typical (5th to 95th percentile) values is emphasized. If extreme values were used similar to qualification test levels, the results would not correlate with field experience.

I-3.3 Mission analysis. The first step in developing the composite mission profile is to determine the types of aircraft and the types of missions with which the store is to be employed. For each aircraft type, each mission will have its own typical mission operational profile, usually charted as altitude and velocity versus time and indicating critical points or periods. A typical aircraft mission operational profile is shown in figure 523.1-1.

The relative frequency for each type of store-carrying mission must be established for each aircraft type along with the proportion of total store use expected for each aircraft type. Tables, such as 523.1-II, are usually prepared to handle this information.

Since both vibration-causing acoustic fields and skin temperatures of a store can be related to altitude and aircraft speed, the pattern of expected altitude/velocity combinations will be needed for each relevant mission. Table 523.1-III shows one method of organizing such data, by dividing each mission into segments or phases. Similar charts for each mission of each aircraft type are suggested. Additionally, a frequency-weighted mean of mission durations should be calculated.

I-3.4 Environment analysis

I-3.4.1 Temperature profile. With a Standard Atmosphere Table the corresponding ambient temperature for each altitude used in the mission analysis may be found. Corresponding store skin temperatures may then be calculated from the ambient temperature when the aircraft velocity is known (see I-2.2.2). Sometimes skin temperature data from instrumented flights is available to provide a check for the calculated temperatures. For each pertinent mission, a chart of expected skin temperature versus time is prepared. Figure 523.1-2 is an example of a temperature profile for a single mission.

The next step is to prepare a frequency distribution of store skin temperatures for a standard day. One method of accomplishing this is to divide each mission into a group of representative stabilized temperature levels (temperatures stabilized for a period of three minutes or more) and then determine the total mission duration for each level. These mission temperature level durations are then weighted for the relative frequency of each mission (i.e., multiplied by the fraction of total mission operations time for the store that the individual mission type is used). A composite distribution can now be generated by performing a sum of the weighted mission durations for each temperature level used.